Course Contents

Second Year

B. Tech. in Civil Engineering

In line with National Education Policy 2020

(Effective from AY 2024-25 for University Department only)

Dr. Babasaheb Ambedkar Technological University

Lonere 402 103, Dist- Raigad, Maharashtra, INDIA

Established vide Maharashtra Act No. XXII of 1989 and Act. No. XXIX of 2014
"Vidyavihar", P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra, India
Telephone and Fax.: 02140 - 275142
www.dbatu.ac.in

Course Structure, Guidelines, Rules and Regulations

Preamble

Economic advancement of a country is closely tied to the quality of technical education it offers. Engineering education is reaching new heights and plays a significant role in the overall education system. The preparation of engineering graduates should focus on enhancing their employability and sustainability in response to evolving industry and societal needs. As technology advances and expectations change rapidly, updating the curriculum to be contemporary and relevant is imperative.

In order to align our technical education system with global standards and practices, based on performance and assessment system was implemented earlier for all Undergraduate Programs (UG). Now as per National

Education Policy-2020 framework we are incorporating project-based learning. The realm of engineering and technology, characterized by its interdisciplinary nature, demands the synthesis of knowledge from a wide array of domains including humanities, arts, and advanced technologies. However, what distinguishes technologists is their proficiency in design and their ability to adeptly apply this knowledge across diverse disciplines to achieve effective problem-solving.

In response to these needs, aspiring engineers need thorough preparation and a deep understanding of the latest technological trends and industrial requirements. This calls for studying under a modern and adaptable curriculum that mirrors the global environment. As part of this initiative, there is a push to integrate recent advancements and enrich course content with pertinent and up-to-date subjects. Consequently, a revised structure and curriculum will debut from the academic year 2023-24 for First Year Civil Engineering, with intentions to progressively implement these updates across second, third- and fourth-year engineering programs.

Project-based learning has been introduced alongside traditional classroom teaching and laboratory-based learning to enhance the overall learning experience. The objective is to encourage students to learn collaboratively in groups of 3 to 4, focusing on solving meaningful problems. These problems can be theoretical, practical, social, technical, symbolic, cultural, or scientific, arising from students' curiosity across various disciplines and professional contexts. The selected problems should be exemplary and may require an interdisciplinary approach for both analysis and resolution. This approach aims to develop students' capacity for learning through shared cognition.

- Laboratory Course:

This is focused on completing experiments and assignments related to the courses of the Semester.

- Seminar: This aspect will revolve around state-of-the-art topics selected by students and approved by the authority. Students are required to submit a certified seminar report in a standard format, evaluated by their assigned guide and the department/institute head for satisfactory completion of the work.
- Project Work in Final Year: Project work in the seventh Semester is integral to the curriculum. It involves applying knowledge gained throughout the graduation program, ideally addressing societal needs. The project provides an opportunity for students to design and construct complete systems or subsystems, specializing in areas of their interest. Students must prepare a certified final project report in standard format, evaluated by their guide and the department/institute head for satisfactory completion of the work.
- Internship: Internships are crucial for educational and career development, offering practical experience in field of discipline. It plays a significant role as employers seek well-trained employees. The primary objective is to expose technical students to real-world industrial environments, providing insights into the social, economic, and administrative factors influencing organizational operations. Students may choose internships in industries, government agencies, NGOs, MSMEs, rural settings, innovation hubs, intellectual property rights (IPR), or entrepreneurship initiatives. They can opt to focus on innovation, leading to start-up's, or gain experience in industry/NGO/government/MSME settings to prepare for professional roles. The conduction, monitoring, assessment, and evaluation of internships follow guidelines provided by AICTE.

Definition of Credit **

1 Hour Lecture (L) per week	1 credit for 1 Hour
Tutorial (T) per week	1 credit for 1 Hour
Practical(P) per week 2 Hours Practical (Lab)/week	1 credit for 2 Hours

** The head of Tutorial and Practical (as a special case) may be merged for common credit with the permission of authority.

Rule No. 1: Eligibility for Admission

Eligibility Criteria

Students seeking admission to the first year of the Bachelor's degree course in Engineering and Technology must fulfil the eligibility criteria as laid down from time to time by the following authorities:

- **Dr. Babasaheb Ambedkar Technological University (DBATU)**
- **Government of Maharashtra**
- **All India Council for Technical Education (AICTE)**

Rule No. 2: Scheme of Assessment

Eligibility for the Degree of Bachelor of Engineering and Technology

To be eligible for the degree of Bachelor of Engineering and Technology, a candidate must:

1. **Appearing for Examinations**:
    - A candidate is required to appear for all prescribed examinations during the course of study. This includes theory exams, practical exams, term-work assessments, project evaluations, and any other form of examination as specified in the Course Contents.
2. **Passing of Examinations**:
    - A candidate must pass all the prescribed examinations. The passing criteria, including minimum marks required in theory, practical, term-work, and other components, will be as per the rules laid down by the university.

Components of Assessment

The scheme of assessment typically includes the following components:

1. **Theory Examinations**:
    - Conducted at the end of each Semester.
    - Assess the theoretical understanding of the subjects.
2. **Practical Examinations**:
    - Conducted to assess the practical skills and application of knowledge.
    - Includes laboratory work, experiments, and practical assignments.
3. **Term-Work Assessments**:
    - Continuous assessment of assignments, tutorials, and project work throughout the Semester.
    - Includes the evaluation of written assignments, presentations, and project reports.
4. **Project Work**:
    - Assessment of project-based learning and final year projects.
    - Includes continuous assessment by the faculty and final evaluation through project reports, presentations, and viva-voce.
5. **Internal Continuous Assessment**:
    - Regular assessments conducted throughout the Semester.
    - Includes quizzes, class tests, mid-term exams, and participation in class activities.

General Rules and Regulations

1. The normal duration of the course leading to B.Tech. degree will be EIGHT semesters.
2. The normal duration of the course leading to M.Tech. degree will be FOUR semesters.

3. Each academic year shall be divided into 2 semesters, each of 20 weeks duration, including evaluation and grade finalization, etc. The Academic Session in each semester shall provide for at least 90 Teaching Days, with at least 40 hours of teaching contact periods in a five to six days session per week. The semester that is typically from Mid-July to November is called the ODD SEMESTER, and the one that is from January to Mid-May is called the EVEN SEMESTER. Academic Session may be scheduled for the Summer Session/Semester as well. For 1st year B. Tech and M. Tech the schedule will be decided as per the admission schedule declared by Government of Maharashtra.
4. The schedule of academic activities for a Semester, including the dates of registration, mid-semester examination, end-semester examination, inter-semester vacation, etc. shall be referred to as the Academic Calendar of the Semester, which shall be prepared by the Dean (Academic), and announced at least TWO weeks before the Closing Date of the previous Semester.
5. The Academic Calendar must be strictly adhered to, and all other activities including co-curricular and/or extra -curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

Registration:

1. Lower and Upper Limits for Course Credits Registered in a Semester, by a Full- Time Student of a UG/PG Program:

   A full time student of a particular UG/PG program shall register for the appropriate number of course credits in each semester/session that is within the minimum and maximum limits specific to that UG/PG program as stipulated in the specific Regulations pertaining to that UG/PG program.
2. Mandatory Pre-Registration for higher semesters: In order to facilitate proper planning of the academic activities of a semester, it is essential for the every institute to inform to Dean (Academics) and COE regarding details of total no. of electives offered (Course-wise) along with the number of students opted for the same. This information should be submitted within two weeks from the date of commencement of the semester as per academic calendar.
3. PhD students can register for any of PG/PhD courses and the corresponding rules of evaluation will apply.
4. Under Graduate students may be permitted to register for a few selected Post Graduate courses, in exceptionally rare circumstances, only if the DUGC/DPGC is convinced of the level of the academic achievement and the potential in a student.

Course Pre-Requisites:

1. In order to register for some courses, it may be required either to have exposure in, or to have completed satisfactorily, or to have prior earned credits in, some specified courses.

2. Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.
3. REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the Dean (Academic) / Principal.
4. A student will be permitted to register in the next semester only if he fulfills the following conditions:
   i) Satisfied all the Academic Requirements to continue with the program of Studies without termination
   ii) Cleared all Institute, Hostel and Library dues and fines (if any) of the previous semesters;
   iii) Paid all required advance payments of the Institute and hostel for the current semester;
   iv) Not been debarred from registering on any specific ground by the Institute.

Evaluation System:

1. Absolute grading system based on absolute marks as indicated below will be implemented from academic year 2023-24, from I year B. Tech.

Percentage of marks	Letter Grade	Grade Point
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
<40	EF	0.0

2. Class is awarded based on CGPA of all eighth semester of B.Tech Program.

CGPA for pass is minimum 5.0	
CGPA upto <5.50	Pass class
CGPA ≥ 5.50&<6.00	Second Class
CGPA ≥ 6.00&<7.5	First Class
CGPA >7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

3. A total of 100 Marks for each theory course are distributed as follows:

Mid Semester Exam (MSE) Marks	20
Continuous Assessment Marks	20
End Semester Examination(ESE)Marks	60

4. A total of 100 Marks for each practical course are distributed as follows

1.	Continuous Assessment Marks	40
2.	End Semester Examination (ESE)Marks	60

- It is mandatory for every student of B. Tech to score a minimum of 40 marks out of 100, M. Tech to score a minimum of 45 marks out of 100 with a minimum of 20 marks out of 60 marks in End Semester Examination for theory course.
- This will be implemented from the first year of B. Tech starting from Academic Year 2023-24

5. Description of Grades

EX Grade: An 'EX' grade stands for outstanding achievement.

EE Grade: The 'EE' grade stands for minimum passing grade.

The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only.

If any of the students remain absent for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.

FF Grade: The 'FF' grade denotes very poor performance, i.e. failure in a course due to poor performance. The students who have been awarded 'FF' grade in a course in any semester must repeat the subject in next semester.

6. Evaluation of Performance

a. Semester Grade Point Average (SGPA)

The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{[\sum_{i=1}^{n} c_i g_i]}{[\sum_{i=1}^{n} c_i]}$$

Where

'n' is the number of subjects for the semester,

'c_i' is the number of credits allotted to a particular subject, and

'g_i' is the grade-points awarded to the student for the subject based on his performance as per the above table.

SGPA will be rounded off to the second place of decimal and recorded as such.

b. Cumulative Grade Point Average (CGPA):

An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he entered the Institute. CGPA is also calculated at the end of every semester (upto two decimal places).Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i g_i]}{[\sum_{i=1}^{m} c_i]}$$

Where,

'm' is the total number of subjects from the first semester onwards up to and including the semester S,

'ci' is the number of credits allotted to a particular subject, and

'gi' is the grade-points awarded to the student for the subject based on his/her performance as per the above table.

CGPA will be rounded off to the second place of decimal and recorded as such.

7. Attendance Requirements:

a. All students must attend every lecture, tutorial and practical classes.

b. To account for approved leave of absence (eg. representing the Institute in sports, games or athletics; placement activities; NCC/NSS activities; etc.) and/or any other such contingencies like medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes actually conducted. If the student failed to maintain 75% attendance, he/she will be detained for appearing the successive examination. The Dean (Academics)/ Principal is permitted to give 10% concession for the genuine reasons as such the case may be. In any case the student will not be permitted for appearing the examination if the attendance is less than 65%.

c. The course instructor handling a course must finalize the attendance 3 calendar days before the last day of classes in the current semester and communicate clearly to the students by displaying prominently in the department and also in report writing to the head of the department concerned.

d. The attendance records are to be maintained by the course instructor and he shall show it to the student, if and when required.

8. Transfer of Credits:

The courses credited elsewhere, in Indian or foreign University/Institutions/ Colleges/Swayam Courses by students during their study period at DBATU may count towards the credit requirements for the award of degree. The guidelines for such transfer of credits are as follows:

a. 20 % of the total credit will be considered for respective calculations.
b. Credits transferred will be considered for overall credits requirements of the program.
c. Credits transfer can be considered only for the course at same level i.e UG, PG etc.
d. A student must provide all details (original or attested authentic copies) such as Course Contents, number of contact hours, course instructor /project guide and evaluation system for the course for which he is requesting a credits transfer. He shall also provide the approval or acceptance letter from the other side. These details will be evaluated by the concerned Board of Studies before giving approval. The Board of Studies will then decide the number of equivalent credits the student will get for such course(s) in DBATU. The complete details will then be forwarded to Dean for approval.
e. A student has to get minimum passing grades/ marks for such courses for which the credits transfers are to be made.
f. Credits transfers availed by a student shall be properly recorded on academic record(s) of the student.
g. In exceptional cases, the students may opt for higher credits than the prescribed.

Table A: Credit Structure for UG program in Engineering

Course Category	Recommended	Provided
Basic Science Course (BSC)	14 to 18	17
Engineering Science Course (ESC)	12 to 16	16
Program Core Course (PCC)	44 to 56	58
Multidisciplinary Minor (MDM)	14	13
Humanities Social Science and Management (HSSM-IKS/VEC/AEC)	14	12
Vocational and Skill Enhancement Course (VSEC)	08	8
Open Elective (OE) Other than a particular program	08	9
Program Elective Course (PEC)	20	19
Experiential Learning Courses (ELC)	22	20
Co-curricular Courses (CC)	02-04	2
TOTAL	**160 to 176**	**174**

Dr. Babasaheb Ambedkar Technological University, Lonere

Teaching & Evaluation Scheme for Second Year B. Tech. Civil Engineering

Sr. No.	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
			L	T	P	ISE	MSE	ESE	Total	
Semester-III										
1	BTCVBST301	Civil Engineering Mathematics	3	0	0	20	20	60	100	3
2	BTCVPCT302	Mechanics of Solids	3	0	0	20	20	60	100	3
3	BTCVPCT303	OPEN ELECTIVE-1 (from bucket)	3	0	0	20	20	60	100	3
4	BTCVPCT304	Surveying	2	0	0	20	20	60	100	2
5	BTCVMDT305	MDM -1 (from bucket)	3	0	0	20	20	60	100	3
6	BTCVPCT306	Building Construction	3	0	0	20	20	60	100	3
7	BTCVPCL307	Mechanics of Solid Lab	0	0	2	50	-	50	100	1
8	BTCVPCL308	Surveying Lab	0	0	2	50	-	50	100	1
9	BTCVMDTL309	MDM-1 Lab (from bucket)	0	0	2	25	-	25	50	1
10	BTCVHMA310	Entrepreneurship Development Process	0	2	0	50	-	-	50	2
11	BTCVHMP311	Life of Bharat Ratna Dr.Babasaheb Ambedkar	1	0	0	50	-	-	50	1
12	BTCVHMA312	Indian Constitution-Value Education	2	0	0	-	-	-	AU	GR
		TOTAL	**20**	**2**	**6**	**345**	**120**	**485**	**950**	**23**
Semester-IV										
1	BTCVPCT401	Structural Mechanics-I	3	0	0	20	20	60	100	3
2	BTCVPCT402	Concrete Technology	3	0	0	20	20	60	100	3
3	BTCVPCT403	Hydraulics Engineering	3	0	0	20	20	60	100	3
4	BTCVPCT404	Building Planning & Drawing	3	0	0	20	20	60	100	3
5	BTCVHMT405	Universal Human Values	3	0	0	20	20	60	100	3
6	BTCVOET406	OPEN ELECTIVE-2 (from bucket)	3	0	0	20	20	60	100	3
7	BTCVPCL407	Concrete Technology Lab	0	0	2	50	-	50	100	1
8	BTCVPCL408	Hydraulics Lab	0	0	2	25	-	25	50	1
9	BTCVPCL409	Building Planning & Drawing Lab	0	0	2	50	-	50	100	1
10	BTCVOEL410	OPEN ELECTIVE-2 –LAB	0	0	2	25	-	25	50	1
11	BTCVHMP411	Life of Chhatrapati Shivaji Maharaj	1	0	0	50	-	-	50	1
		TOTAL	**19**	**2**	**6**	**320**	**120**	**510**	**950**	**23**

Sr.No.	Multidisciplinary Minor Courses	Open Elective (OE)
A	Engineering Geology	Building Materials
B	Geomatics	Advanced Surveying
C	MOOC-/SWAYAM/ NPTEL	Advanced Geographical Information Systems
		Applications of Drone Technology

LIST OF ELECTIVE / OPEN ELECTIVE/ MULTIDISCIPLINARY MINOR COURSES

Below listed courses will be offered as per student's requirement and availability of subject expert with the approval of the head of the department.

MULTIDISCIPLINARY MINOR COURSES (B.Tech Civil Program)

Sr.No.	Course Offered	Teaching Scheme (Hrs)				Credits
		L	T	P	TOTAL	
1	Introduction to Engineering Geology	03	00	02	04	04
2	Geomatics	03	00	00	03	03
3	Engineering Economics and Project Management	02	00	00	02	03
4	Town and Urban Planning	02	00	00	02	02
5	Advanced Environmental Engineering	02	00	00	02	02
6	MOOC/SWAYAM/NPTEL	02	00	00	02	02

MULTIDISCIPLINARY MINOR COURSES (Other than B.Tech Civil Program)

Semester	Category	Subject Code	Subject Name	Total Credit
SEM-III	Foundation Courses	BTCVMDT305	Introduction to Engineering Geology	3
SEM-IV	Applied Engineering Courses	BTCVMDL406	Geomatics	3
SEM-V	Applied Engineering Courses	BTCVMDL506	Engineering Economics and Project Management	3
SEM-VI	Electives/Specialization Courses	BTCVMDT606	Town and Urban Planning	2
SEM-VII	Electives/Specialization Courses	BTCVMDT706	Advanced Environmental Engineering	2
SEM-VIII	Online Course	BTCVMDT801	MOOC/SWAYAM/NPTEL	2
TOTAL CREDITS REQUIRED TO COMPLETE A MINOR DEGREE IN CIVIL ENGINEERING				**15**

OPEN ELECTIVE OTHER THAN PARTICULAR PROGRAM

Sr.No.	Course Offered	Teaching Scheme (Hrs)				Credits
		L	T	P	TOTAL	
1	Building Materials	02	00	00	02	02
2	Advanced Surveying	03	00	02	04	04
3	Advanced Geographical Information Systems	03	00	00	03	03
4	Operation Research	03	00	00	03	03
5	Design of Masonry Structures	03	00	00	03	03
6	Industrial Waste Treatment	03	00	00	03	03
7	Air Pollution	03	00	00	03	03
8	Applications of Drone Technology	03	00	00	03	03
9	Bridge and Tunnel Engineering	03	00	00	03	03
10	Road Safety Audit	03	00	00	03	03

HONORS- CIVIL ENGINEERING

Sr.No.	Course Offered	Teaching Scheme (Hrs)				Credits
		L	T	P	TOTAL	
1	Finite Element Method	03	00	00	03	03
2	Limit State Design of Steel Structures	03	00	00	03	03
3	Elements of Remote Sensing	03	00	00	03	03
4	Building Planning and Design	03	00	00	03	03
5	Advanced Structural Design	03	00	00	03	03
6	Theory of Plates and Shells	03	00	00	03	03

RESEARCH - CIVIL ENGINEERING

Sr.No.	Course Offered	Teaching Scheme (Hrs)				Credits
		L	T	P	TOTAL	
1	Problem Identification and Definition	03	01	00	04	04
2	Experimental Work/ Analytical Tools and Prototype Development	03	01	00	04	04
3	Literature Review	03	01	00	04	04
4	Publication	03	01	00	04	04
5	Data Analysis	03	01	00	04	04

PROGRAM ELECTIVE COURSE	
A	Professional Practice
B	Water Quality Engineering
C	Geomatics
D	Town and Urban Planning
E	Material, Testing and Evaluation
F	Pollution Control & Treatment
G	Highway & Railway Engineering
H	Structural Audit
I	Intelligent Transportation Systems
J	Plastic Analysis of Structures
K	Infrastructure Engineering
L	Environmental Impact Assessment

Note: The elective courses listed in the Course Contents structure are indicative. Students shall ensure availability of Course Contents prior to registration.

Dr. Babasaheb Ambedkar Technological University, Lonere

Teaching & Evaluation Scheme for Second Year B. Tech. Civil Engineering

Sr. No.	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
			L	T	P	ISE	MSE	ESE	Total	
Semester-III										
1	BTCVBST301	Civil Engineering Mathematics	3	0	0	20	20	60	100	3
2	BTCVPCT302	Mechanics of Solids	3	0	0	20	20	60	100	3
3	BTCVPCT303	OPEN ELECTIVE-1 (from bucket)	3	0	0	20	20	60	100	3
4	BTCVPCT304	Surveying	2	0	0	20	20	60	100	2
5	BTCVMDT305	MDM -1 (from bucket)	3	0	0	20	20	60	100	3
6	BTCVPCT306	Building Construction	3	0	0	20	20	60	100	3
7	BTCVPCL307	Mechanics of Solid Lab	0	0	2	50	-	50	100	1
8	BTCVPCL308	Surveying Lab	0	0	2	50	-	50	100	1
9	BTCVMDTL309	MDM-1 Lab (from bucket)	0	0	2	25	-	25	50	1
10	BTCVHMA310	Entrepreneurship Development Process	0	2	0	50	-	-	50	2
11	BTCVHMP311	Life of Bharat Ratna Dr.Babasaheb Ambedkar	1	0	0	50	-	-	50	1
12	BTCVHMA312	Indian Constitution-Value Education	2	0	0	-	-	-	AU	GR
		TOTAL	**20**	**2**	**6**	**345**	**120**	**485**	**950**	**23**

Sr.No.	Multidisciplinary Minor Courses	Open Elective (OE)
A	Engineering Geology	Building Materials
B	MOOC-/SWAYAM/ NPTEL	Advanced Surveying
C		Advanced Geographical Information Systems
		Applications of Drone Technology

Detailed Course Contents

SUBJECT CODE	Civil Engineering Mathematics						CREDITS
BTCVBST301							3
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	03	20	20	60	100

Course Outcomes: Students will be able to	
CO1	Able to comprehend the fundamental knowledge of the Laplace and inverse Laplace transforms and their derivatives for elementary functions
CO2	Able to apply the properties of Laplace and inverse Laplace transforms to solve simultaneous linear and linear differential equations with constant coefficients
CO3	Able to conceptualize the definitions and properties of Fourier transforms,to solve boundary value problems using Fourier transforms
CO4	Able to find the solutions of partial differential equations governing real-world problems
CO5	Able to conceptualize limit, continuity, derivative and integration of complex functions, complex integrals useful in real-world problems

Course Contents

Module 1	**Laplace Transform**	**Hrs. 9**
Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.		
Module 2	**Inverse Laplace Transform**	**Hrs. 9**
Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse ,Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.		
Module 3	**Fourier Transform**	**Hrs. 7**
Definitions – integral transforms; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.		
Module 4	**Partial Differential Equations and Their Applications**	**Hrs. 9**
Formation of Partial differential equations by eliminating arbitrary constants and functions; heat Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional flow equation $\left(\mathbf{i.e}\ \frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}\right)$, and one		

dimensional wave equation (i.e. $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$).		
Module 5	**Functions of Complex Variables**	**Hrs. 9**
Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).		

Text Books:	
1	Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2	Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd.,
3	Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.

Reference Books:	
1	Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
2	A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd. , Singapore.
3	Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.
4	Integral Transforms by I. N. Sneddon, Tata McGraw-Hill , New York.

SUBJECT CODE	Mechanics of Solids			CREDITS			
BTCVPCT302				3			
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	03	20	20	60	100

Pre-requisite: Engineering Mechanics

Course Objectives	
1	To understand concept of various types of stresses and strains
2	To study axial force, shear force, bending moment for determinate beams
3	To study concept of stresses in beam
4	To learn the concept of short and long columns

Course Outcomes: On completion of course, students will be able to	
CO1	Perform the stress-strain analysis.
CO2	Draw force, and bending moment distribution diagrams for determinate beams.
CO3	Determine stresses in beam, and distribution of stress for various cross sections.
CO4	Understand concept of Principal stresses and strains, and perform failure analysis
CO5	Analyse columns, shafts, and stresses in thin walled members

Course Contents

Module 1	Stresses and Strains	Hrs. 08
Stresses and strains: Analysis of internal forces, normal stress, shearing stress, bearing stress, statically indeterminate members. Stress-strain diagram for different engineering materials. Hooke's law: axial and shearing deformations, Poisson's ratio: biaxial and tri-axial state of stress, State of simple shear, Elastic constants and their inter-relation, introduction to strain measurement devices, Sensors: working principle. Concept of strain energy: Elastic, plastic and rigid members, stresses due to Gradually applied loads, Suddenly applied loads, and Impact loads, Thermal stresses.		
Module 2	**Axial Force, Shear Force and Bending Moment**	**Hrs. 08**
Axial force, shear force and bending moment in beams: concept of unbalanced forces and moments at a transverse section, axial forces, shear forces and bending moment diagram, relations among load shear and moment, introduction to moving loads.		
Module 3	**Stresses in beams, and Direct and bending stresses**	**Hrs. 08**
Simple bending: assumptions and derivation of flexural formula, economic sections, analysis of flexural action, moment of resistance, section modulus. Shearing stress: Derivation of formula, shear stress distribution for various cross sections, concept of shear flow, shear lag and shear center. Direct and bending stresses: Combined axial loads and bending moment , uniaxial & biaxial eccentric load, Kern of a section.		
Module 4	**Combined stresses and strains, and Theories of failure**	**Hrs. 08**
Combined stresses and strains: Analytical and graphical representation of state of combined stress at a point, absolute maximum shearing stress, principal stresses and strains, application of Mohr's circle. Theories of Failure: maximum principal stress theory, maximum principal strain theory, maximum strain energy theory, maximum shear stress theory, maximum shear strain theory.		
Module 5	**Columns & Struts, Torsion of shafts, and Thin Walled Structures**	**Hrs. 08**
Columns and Struts: Concept of short and long columns, formulae by Euler, Euler's Crippling load for different end conditions, limitations of Euler's formula, equivalent length, Rankine's formula and its applications Torsion: Assumptions, derivation of torsion formulae, torsion of circular shafts, power transmission, stresses and deformation in determinate solid/hollow homogeneous shafts Thin cylinders and spheres: circumferential and longitudinal stresses		

Text Books:

1	Singer F.L. and Pytle, 2011, "Strength of Materials", Harper Collins Publishers, 4th Edition
2	Junnarkar S.B., 2014, "Mechanics of Structures", Charotor Publishers, Anand, 31st edition,
3	Khurmi R.S., 2018, "Strength of Material", S. Chand and Co., New Delhi
4	Sadhu Singh, 1978, "Strength of Materials", Khanna Publishers, N. Dehli
5	Prasad I.B, 1988, "A text book of Strength of Materials", Khanna Publishers, N. Dehli
6	Timoshenko S.P. and Young D.H., 2002, "Elements of Strength of Materials", East West Press
7	Ramamrutham S., 2011, "Strength of Materials", Dhanpat Rai and Sons, Delhi
8	Ramamrutham S., and R. Narayanan 2020, "Theory of Structures", Dhanpat Rai and Sons

Reference Books:

1	Beer F P., Jhonston E. R., John. T. D E wolf, 2017, "Mechanics of Materials" TMH

2	Popov E.P.,2015, "Introduction to Mechanics of Solids", Prentice-Hall, Second Edition 2005
3	Crandall S.H., Dahl N.C., & Lardner T.J., 1955, "An Introduction to Mechanics of Solids", Tata McGraw Hill, 2nd Edi, 1978
4	Nash W., 2005, "Strength of Materials Schaum's outline series", McGraw Hill, fourth edition
5	Punmia B. C., 2018, "Mechanics of Materials" Laxmi Publications, revised edition, 2016
6	Subramanian R., 2016, "Strength of Materials" Oxford University Press, 2nd edition

SUBJECT CODE	Building Materials			CREDITS			
BTCVPCT303				03			
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	03	20	20	60	100

Course Objectives	
CO1	Learn materials required for masonry construction
CO2	Learn materials required for floor finishing work.
CO3	Study the materials for door, windows, reinforcement.
CO4	Learn the materials required for painting work.
CO5	Learn the smart construction materials

Course Outcomes: Students will be able to	
CO1	Understand building materials with their properties.
CO2	Understand selection of appropriate material.
CO3	Understand specifications of materials.
CO4	Understand the use of materials for painting.
CO5	Understand about smart construction materials.

Course Contents

Module 1	**Stones & Bricks**	**Hrs. 5**
Natural & Artificial materials used in construction, Properties of building materials -Physical properties Mechanical properties, Chemical properties, Electrical properties, Magnetic properties, Thermal properties. Stone: Classification of rocks, qualities of good building stones, Tests for stones, Dressing of stones, common building stones in India, Use of stone in construction Brick: Ingredient of brick earth, manufacture of Brick, Quality of good brick, Tests for bricks, Classification of bricks, Standard size of brick, Use of brick		
Module 2	**Diverse materials & Floor Finishes**	**Hrs. 6**
Glass, Aluminum, Asbestos, Asphalt, Bitumen**,** Cork, Gypsum, Fly ash. Rubber, adhesives, Mangalore tiles, Terracotta, sound absorbent materials. Floor Finish – mud, murrum, Tiles, flag stone, cement concrete, Terrazzo, Mosaic, Asphalt**,** Fiber Reinforced Polymer.		
Module 3	**Timber & Steel**	**Hrs. 5**
Timber - Soft wood, hard wood, defects in timber, Qualities of good timber, preservation of timber,		

Seasoning of timber, Plywood Steel – Manufacturing of steel, Use of steel, factors affecting physical properties of steel, market forms of steel, properties of mild steel, preventive measures for corrosion		
Module 4	**Paints, varnishes & distemper**	**Hrs. 4**
Paints – Classification of an ideal paint, Ingredients of an oil borne paint, Types of paints – cement paint, emulsion paint, enamel paint, oil paint, process of painting Varnish – classification of an ideal varnish, Ingredients of varnish, Types of varnish Distemper – Properties of distemper, Ingredients of distemper, process of distempering		
Module 5	**Smart Construction Materials**	**Hrs. 4**
Definition, Principles of Piezo-electricity, materials (Polymers and Ceramics), sensors (Piezo-electric sensor, strain gauge, shear sensor, in-plane and out of plane sensor, accelerometer), smart composites Electro strictive Materials, Magnetostrictive materials, Magnetoelectric materials, Magnetorheological fluids, Electrorheological fluids, Shape Memory materials		

Text Books:	
1	Ghose, D. N. Construction Materials Tata McGraw Hill, New Delhi, 2014 ISBN: 9780074516478
2	Rangwala, S.C. Engineering Materials Charator publisher, Ahemdabad, 2015, ISBN: 9789385039171
3	S. P. Arora and Bindra, Building Construction, Dhanpat Rai Publication, Delhi Edition 2013, ISBN: 9788189928803
4	Sushil Kumar, Building Construction, Standard Publication, Edition 2010, ISBN: 9788180141683,

Reference Books:	
1	Dr. B.C. Punmia, Building construction Laxmi publications, 10th edition 2016, (ISBN
2	A Text Book of Building Construction – S.P. Arora, S.P. Bindra (Dhanpat Rai Publications)
3	Engineering Materials – R.K. Rajput (S. Chand) • Handbook of Building Construction

SUBJECT CODE	Surveying			CREDITS			
BTCVPCT304				3			
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	03	20	20	60	100

Course Objectives	
CO1	Describe the function of surveying in civil engineering construction.
CO2	Identify the sources of measurement errors and mistakes; understand the difference between accuracy and precision as it relates to distance, differential leveling, and angular measurements
CO3	Perform traverse calculations; determine latitudes, departures, and coordinates of control points and balancing errors in a traverse.
CO4	Operate a total station to measure distance, angles, and to calculate differences in elevation.

Course Outcomes: Students will be able to	
CO1	Demonstrate various methods of linear and angular measurements.
CO2	Analyse surveying data of different types.
CO3	Conduct field work and application of scientific methodology in handling field data
CO4	Apply various surveying techniques for civil engineering problems
CO5	To prepare a map or plan to represent an area on a horizontal plan

Course Contents

Module 1	Linear Measurements	Hrs. 6
Definition, principles of surveying, classification, fields and office work, scales, conventional signs .Survey instruments, their care and adjustment, ranging and chaining, offsetting, plotting chain survey data, errors in chain and tapes, corrections- length, slope, temperature, pull sag reciprocal ranging, setting perpendiculars, well-conditioned triangles, traversing, plotting , enlarging and reducing figures		
Module 2	**Angular Measurements and Plane Table Survey**	**Hrs. 7**
Prismatic compass, surveyor's compass, bearing systems and conversions, local attraction, magnetic declination, dip traversing, adjustment of errors Plane table instruments and accessories, merits and demerits, methods: radiation, intersection, resection, traversing		
Module 3	**Levelling and Contouring**	**Hrs. 7**
Level line - Horizontal line - Levels and Staves, Sprit level – Sensitiveness, Bench marks - and Plotting Temporary and permanent adjustments, Fly and Check leveling, Booking, reduction, Curvature Refraction – reciprocal leveling - Longitudinal and cross sections -plotting Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs. Planimeter-Types, Theory, concept of zero circle, Study of Digital Planimeter, Computation of Areas and Volumes		
Module 4	**Theodolite Traversing**	**Hrs. 7**
Theodolite - Vernier and micro-optic - Description and uses - temporary and permanent adjustments of vernier transit –Angles: Horizontal - Vertical - Heights and Distances - Traversing - Closing error and distribution - Gales's table - Omitted measurements		
Module 5	**Engineering Survey**	**Hrs. 7**
Reconnaissance, Preliminary and location surveys for engineering projects, Layout, Setting out works, Route Surveys for highways, railways and waterways, Mine Surveying - Instruments – Tunnels: correlation of underground and surface surveys, shafts		

Text Books:	
1	Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S. V. Kulkarni, Pune Vidyarthi Griha Prakashan..
2	Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, Laxmi Publications.

3	Plane Surveying & Higher Surveying by Dr A. M. Chandra, New age international publishers New Delhi
4	Kanetkar T.P. and Kulkarni S.V. "Surveying and Levelling – Part2", Pune Vidyarthi Griha Prakashan, Pune.

Reference Books:	
1	Duggal S. K. "Surveying Volume II", Tata McGraw-Hill Publishing Company Limited.
2	Subramanium R., "Surveying & Levelling", Oxford University Press.
3	Clark D., 1944, "Plane and Geodetic Surveying", Vol. I & II, C.B.S. Pub. & Distri., N. Delhi, 6th edi.
4	Duggal S. K. "Surveying Volume I", Tata McGraw-Hill Publishing Company Limited.

SUBJECT CODE	MDM -1 (Engineering Geology)			CREDITS			
BTCVMDT305				3			
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	3	20	20	60	100

Course Objectives	
CO1	To recognize and classify rock and soil materials to identify suitable construction materials or as a stable foundation.
CO2	To offer the essential geological knowledge necessary for the construction of various kinds of civil engineering structures.
CO3	To focus on the core activities of engineering geologists like site characterization and geologic hazard identification and mitigation.
CO4	To arrange, and carry out site investigation methods to extract the necessary characteristics for a variety of technical applications.
CO5	To interpret field and laboratory data for safety and security of mega structures like tunnels and dams

Course Outcomes: Students will be able to	
CO1	Learn mineralogical and petrological features that are significant in characterizing its competency as
CO2	Learn how different geological conditions influence the design parameters of Civil Engineering
CO3	Understand the earth's structure and deformation history before applying rock mechanics theory.
CO4	Understand the site selection criteria for designing civil engineering projects that are both safe and
CO5	Learn about the influence of geological conditions on dams and tunnels, and also provide related

Course Contents

Module 1	**Introduction and Geomorphology**	**Hrs. 8**

Introduction and history of Engineering Geology and related branches, applications in Civil engineering. Interior of Earth, Plate tectonics, Earthquakes, seismic zones in India. Geomorphology: - basic principles and processes loke denudation and types of weathering. Landform formation and types associated with river, wind, and sea, and their relevance to civil engineering.		
Module 2	**Mineralogy and Petrology**	**Hrs. 8**
Mineralogy: - Study of physical properties of minerals and study of common rock-forming minerals & clay minerals. Petrology: Definition, rock cycle. Civil engineering significance. Igneous rocks: Origin, classification, textures, related structures, and their importance. Sedimentary rocks: Formation, classification, textures and structures, and their importance. Metamorphic rocks: Agents and types of metamorphism, textures, and structures and their importance.		
Module 3	**Structural Geology and Groundwater**	**Hrs. 6**
Geological maps: - Geologic cross-section, Attitude of beds like outcrops, strike, and dip. Study of tectonic structures like folds and faults their origin, classification, diverse effects, and case studies. Joints and unconformities their origin, types, and diverse effects case studies. Groundwater: Sources of groundwater, water table, zones of groundwater, porosity, and permeability.		
Module 4	**Geological Investigations**	**Hrs. 6**
Introduction, geological survey, steps in geological investigations. Exploratory drilling types and limitations, preservation of cores, core logging, core recovery, Rock Quality Designation (RQD). Engineering properties of rocks like density, unit weight, porosity, strength, and index properties. Geophysical investigation applications in Civil engineering methods like electrical resistivity method, gravity method.		
Module 5	**Geology of Dams, Reservoirs, and Tunnels**	**Hrs. 8**
Dams: - Influence of geological conditions on location, alignment, design, and type of a dam, geological considerations in site selection for dams, and site improvement techniques e.g. grouting. Tunneling: - Types of tunnels, tunneling in various conditions e.g. folded/faulted region, deccan trap or any other kind of rocks. Influence of geological conditions on tunneling and remedial measures like tunnel lining. Bridges: - Types of bridges, dependence of types of bridges on geological conditions and remedial measures.		

Text Books:	
1	Singh Prabin, 2009, "Engineering and General Geology", S. K. Katariya and sons, Delhi.
2	Mukerjee P. K., 2013, "A Text Book of Geology", World Press Pvt. Ltd., Calcutta.
3	Gokhale K.V.G.K. and Rao D. M., 1982, "Experiments in Engineering Geology", TMN, New-Delhi.
4	Gupte R. B., "A Text Book of Engineering Geology", Pune Vidyarthi Griha Prakashan, Pune.
5	Subinoy Gangopadhyay, 2013, "Engineering Geology", Oxford University Press.

Reference Books:	
1	G. W. Tyrrell, 1926, "Principles of Petrology", B. I. Publication Pvt. Ltd., New Delhi .
2	Legget R. F., 1983"Geology Handbook in Civil Engineering", McGraw-Hill, New York.
3	Krynine D. P. & Judd W. R., 2005, "Principles of Engineering Geology & Geo- technics", CBS Publishers & distri. New Delhi.
4	Billings M. P., 1942, "Structural Geology", Prentice Hall of India Private Ltd., New Delhi.
5	A. Holmes, 1944, "Principles of Physical Geology", ELBS Chapman & Hall, London.

SUBJECT CODE	Building Construction			CREDITS			
BTCVPCT306				3			
Teaching Work Load/week (Hrs.)				Examination Scheme (Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	3	20	20	60	100

Course Objectives	
CO1	Learn masonry construction with reference to different building material - stone, brick etc
CO2	Learn construction details of all components of RCC frame structures
CO3	Learn means of communication – door, window, staircase, ramp
CO4	Learn types and construction details of roof in timber & steel
CO5	Learn Low-cost construction & pre cast construction techniques

Course Outcomes: Students will be able to	
CO1	Understand & Draw construction details of load bearing structures
CO2	Understand & Draw construction details of RCC frame structures
CO3	Understand & Draw construction details of different types of means of communication
CO4	Understand & Draw construction details of different types of Roofs
CO5	Understand & Draw construction details of low-cost construction & pre cast construction

Course Contents

Module 1	Masonry Construction	Hrs. 8

Stone masonry: Setting of stone, joints, Random rubble, un-coursed rubble, coursed rubble & ashlar, General principles observed in stone Masonry

Brick masonry: General principles observed in Brick masonry, Bonds – English bond, Flemish Bond

Composite Masonry: types, Partition walls in brick, concrete block, timber, glass & aluminum, autoclaved blocks, fly ash bricks

Spanning members in Masonry construction – a) Arch – Types, method of construction b) Lintels – steel, timber, stone, RCC

Foundation – Dewatering, Excavation for Foundation, soil bearing capacity, Timbering and Strutting, Foundation detail

Module 2	Reinforced Cement Concrete	Hrs. 8

Concrete & Reinforcement: Ingredients of concrete, mix design, Properties, tests, curing, Mixing, Reinforcement specification etc. **Footing Types:** Column Footing, Isolated and Combined Column Footing, Raft Foundation, Types of Pile foundation – bearing, friction, sheet, anchor, batter, fender, compaction **Column, Slab & Beam:** Construction detail, Reinforcement, Slab (one way & two way), Type of beams – simply supported, continuous, cantilever **Formwork:** Definition, Requirements, Materials used, Types and Removal of Formwork.		
Module 3	**Means of Communication**	**Hrs. 6**
Horizontal Communication: Doors –Components of Doors, Classification, Battened & ledged, Battened, ledged & braced, batten, ledged, braced & framed, framed & paneled, glazed, flush, revolving, sliding, collapsible, rolling **Windows:** Component of windows, Types of Windows: fixed, pivoted, double hung, sliding, casement, glazed, louvered, metal, dormer, sky light, ventilators, bay window **Vertical Communication** – a) Stair Case, Types – straight, dog legged, open newel, geometrical, Bifurcated, circular b) Construction detail -staircase in Timber, stone, RCC, steel, etc c) Designing staircase with given area & height **Vertical Communication** - Lift, Elevator and Escalators, Guidelines of ramp for physically handicapped person, minimum size requirement, construction detail		
Module 4	**Roofs & Floors**	**Hrs. 6**
Roofs – a) Types - Pitched, Flat, lean-to roof, coupled roof, Couple close roof, Collar roof, Scissor roof, Domes, Shells b) components of pitched roof – wall plate, rafter, purlin, batten etc, **Trusses** – a) Timber – king post truss, queen post truss b) steel trusses (types, joints) **Floors** – Timber floor, Timber floors supported on rolled steel joist, Flag stone floors resting on steel joists, Jack arch floors, Ribbed floors, pre cast concrete floor **Roof covering** – Thatch covering, Shingles, Manglore Tiles, Aesbestos cement sheets, galvanized corrugated iron sheet, slates		
Module 5	**Pre-fabricated structures, Building Skin, Low-cost construction**	**Hrs. 6**
Pre-fabricated structure - Principles- advantages and disadvantages, types of prefabricate, standardization, basic, nominal and actual dimensions, tolerances, joints production, transportation and erection **Building Skin** – Curtain walls with transoms, mullions and infilling panels of various materials, Suspended Glazing, Composite panel cladding **Low-cost construction techniques** – Rat trap bond, compressed stabilized earth blocks, Bamboo construction, hollow blocks, pre cast wall & roof panels		

Text Books:	
1	Ghose, D. N. Construction Materials Tata McGraw Hill, New Delhi, 2014 ISBN: 9780074516478
2	Rangwala, S. C. Engineering Materials Charator publisher, Ahemdabad, 2015, ISBN: 9789385039171
3	S. P. Arora and Bindra, Building Construction, Dhanpat Rai Publication, Delhi Edition 2013, ISBN: 9788189928803
4	S. C. Rangawala, Building Construction Charotar Publication, Dist-Anand ISBN-10: 8185594856 ISBN-13: 978-8185594859
5	Sushil Kumar, Building Construction, Standard Publication, Edition 2010, ISBN: 9788180141683, 8180141683
6	Francis D. K. Ching, Building Construction

Reference Books:	
1	Dr. B.C. Punmia, Building construction Laxmi publications, 10th edition 2016, (ISBN 9788131804285) .
2	A Text Book of Building Construction – S.P. Arora, S.P. Bindra (Dhanpat Rai Publications)
3	A to Z of Practical Building Construction and Its Management- Sandeep Mantri (Satya Prakashan, New Delhi)
4	Construction Technology (Volume 1 to 4) – R. Chudley (ELBS)
5	Engineering Materials – R.K. Rajput (S. Chand) • Handbook of Building Construction

SUBJECT CODE	Mechanics of Solid Lab						CREDITS
BTCVPCL307							1
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
0	0	2	2	50	-	50	100

Course Outcomes:	Students will be able to
CO1	Evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens.
CO2	Determine the strength of coarse aggregates.
CO3	Find the compressive strength of concrete cubes and bricks.
CO4	Apply field procedures in basic types of surveys, as part of a surveying team.
CO5	Determine physical properties of given coarse aggregates, fine aggregates and cement samples.

Course Contents

Practical Work consists of performance of at least seven experiments from the list below (excluding the eleventh study) experiment: Detailed report is expected

Preform at least 08 experiments as per requirements

Experiment No 1	Tension test on ferrous and non-ferrous alloys (mild steel / cast iron /aluminum etc.)
Experiment No 2	Compression test on mild steel, aluminum, concrete, and wood.
Experiment No 3	Shear test on mild steel and aluminum (single and double shear tests).
Experiment No 4	Torsion test on mild steel and cast iron solid bars and pipes.
Experiment No 5	Flexure test on timber and cast iron beams.
Experiment No 6	Deflection test on mild steel and wooden beam specimens.
Experiment No 7	Graphical solution method for principal stress problems.

Experiment No 8	Impact test on mild steel, brass, Aluminum, and cast iron specimens.
Experiment No 9	Experimental on thermal stresses.
Experiment No 10	Strain measurement involving strain gauges / rosette
Assignment	Involving computer programming for simple problems of stress, strain computations is to be submitted

SUBJECT CODE	Surveying Lab						CREDITS
BTCVPCL308							1
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
0	0	2	2	50	-	50	100

Course Outcomes:	Students will be able to
CO1	Use the theodolite along with chain/tape, compass on the field.
CO2	Apply geometric and trigonometric principles of basic surveying calculations.
CO3	Plan a survey, taking accurate measurements, field booking, and adjustment of errors.
CO4	Apply field procedures in basic types of surveys, as part of a surveying team.
CO5	Employ drawing techniques in the development of a topographic map.

Course Contents

Practical Work consists of performances among the list below and detailed reporting in form of field book, journal and drawing sheets. Perform each of the following practical work.

Preform at least 08 experiments as per requirements

Experiment No 1	Chain and compass Traverse Survey
Experiment No 2	Study and use of dumpy level, auto level to determine elevation of various points.
Experiment No 3	Measurement of horizontal and vertical angles by transit Theodolite.
Experiment No 4	Measurement of horizontal angles by repetition method.
Experiment No 5	Computation of horizontal distances and elevations by Tacheometry
Experiment No 6	Measurement of Magnetic Bearing and Vertical Angle by Theodolite
Experiment No 7	Radiation & intersection methods in plane table survey.
Experiment No 8	Curves setting – different methods (Two exercise)

SUBJECT CODE	Engineering Geology Lab						CREDITS
BTCVMDTL309							1
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
0	0	2	2	25	-	25	50

Course Objectives	
CO1	To recognize and classify rock and soil materials to identify suitable construction materials or as a stable foundation.
CO2	To offer the essential geological knowledge necessary for the construction of various kinds of civil engineering structures.
CO3	To focus on the core activities of engineering geologists like site characterization and geologic hazard identification and mitigation.
CO4	To arrange, and carry out site investigation methods to extract the necessary characteristics for a variety of technical applications.
CO5	To interpret field and laboratory data for safety and security of mega structures like tunnels and dams

Course Outcomes: Students will be able to	
CO1	Identify minerals and rocks as basic components of foundation and construction material.
CO2	Read and interpret geological maps to identify and solve various geological difficulties.
CO3	Identify structures present in the field by studying structural geological blocks.
CO4	Read and identify the lithologs to assess the sub-surface ground quality for construction of any Civil
CO5	Identify various geological structures in the field to avoid any mishaps.

Course Contents

Perform at least 06 to 08 experiments as per the requirements

Experiment No 1	Study of physical properties of minerals.
Experiment No 2	Megascopic study of rock forming minerals.
Experiment No 3	Megascopic study of Igneous rocks.
Experiment No 4	Megascopic study of Secondary rocks.
Experiment No 5	Megascopic study of Metamorphic rocks.
Experiment No 6	Cross-section preparation and interpretation of geological maps.
Experiment No 7	Study of structural geological models.
Experiment No 8	Preparation and interpretation of bore log /litholog data on graph paper.
Experiment No 9	Study visit to the places of engineering geological importance.

SUBJECT CODE	Entrepreneurship Development Process			CREDITS			
BTCVHMA310				2			
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
0	2	0	2	50	-	50	100

Course Objectives:	Students will be able to
CO1	To know need and barriers in the field of Entrepreneurship.
CO2	To understand the concept and process of entrepreneurship & Entrepreneurial Value.
CO3	To appreciate and apply the innovation and process of innovation
CO4	To learn the process and skills of creation and management of entrepreneurial venture
CO5	To learn typology of Entrepreneurship.

Course Outcomes:	Students will be able to
CO1	To know need and barriers in the field of Entrepreneurship.
CO2	To understand the concept and process of entrepreneurship & Entrepreneurial Value.
CO3	To appreciate and apply the innovation and process of innovation
CO4	To learn the process and skills of creation and management of entrepreneurial venture
CO5	To learn typology of Entrepreneurship.

Course Contents

Module 1	**Introduction to the field of Entrepreneurship**	**Hrs. 6**
Understanding entrepreneurship- Need and Importance for entrepreneurship development Mc Clelands Theory of Entrepreneurial Motivation, Barriers to entrepreneurship, Qualities of a successful entrepreneur Entrepreneurial Leadership/Intrapreneurship		
Module 2	**Entrepreneurial Value & Types**	**Hrs. 6**
Concept, Functions, Need. Myths about Entrepreneurship, Process of Entrepreneurship, Types of Entrepreneurs. Competencies and Characteristics of good Entrepreneurs, Entrepreneurial Value: Values, Attitudes and Motivation. Mindset.		
Module 3	**Innovation and entrepreneurship**	**Hrs. 6**
Innovation, definition and classification. The relationship of innovation and entrepreneurship, creation of competitive advantage based on innovation. Innovative models. Product, process, organizational and marketing innovation and their role in business development, Entrepreneur Entrepreneurship- Innovation and Problem Solving. Market understanding, Creativity & Entrepreneurship, Sources of ideas, Techniques of generating new ideas Sources of innovation (push, pull, analogies), transfer of technology. Creative methods and approaches used in innovation management.		

Module 4	Creating Entrepreneurial ventures	Hrs. 4
Analysis of continuous beams propped cantilevers, continuous beams - theorem of three moments - analysis of continuous beams settlement effects, thermal effect, Shear Force and Bending Moment diagrams for continuous beams, portal frames with and without sway.		
Module 5	**Typology of Entrepreneurship**	**Hrs. 2**
Family Business in India: types of Family Business, Improving family businesses, Succession planning. E-Commerce/ franchising: Types of e –commerce, types of franchising businesses.		

Text Books:	
1	Entrepreneurship by Hisrich Robert D/ Peters Micheal New Delhi / Tata McGraw Hill /2002
2	Entrepreneurial Management by P.N. Singh / J. C. Saboo Dr. P. N. Singh Centre for HRD
3	Entrepreneurial Development by Colombo Plan, New Delhi, Tata McGraw Hill, 1998
4	T. H. Byers, R. C. Dorf, A. Nelson, Technology Ventures: From Idea to Enterprise, McGraw Hill (2013)
5	Entrepreneurial Development by Gupta C. B. New Delhi, Somaiya Publication, 1995

Reference Books:	
1	Entrepreneurship Small Scale Industries by G. S. Batra and R. C. Dangal, Deep & Deep Publications Pvt., Ltd.,
2	Development Banks and Entrepreneurship Promotion in India by P. K. Sharma, Mittal Publications
3	Entrepreneurial Development by Vasant Desai (3 Volumes) Himalayan Pub House
4	Kachru Upendra: India Land of a Billion Entrepreneurs, Pearson.
5	Cases in International Entrepreneurship by Hisrich R. D., Chicago, Liven, 1997

SUBJECT CODE	Indian Constitution-Value Education	CREDITS
BTCVHMA312		AU

Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
0	2	0	2	--	--	--	GR

Course Objectives	
CO1	To create awareness about the Constitution of India and the essential values that are incorporated in it, i.e. Fundamental Rights, Fundamental Duties, DPSPs, etc.
CO2	To learn, along with their development and mechanism, about the divisions of executive, legislative and judiciary
CO3	To learn the function of the seminal positions in the government, like Prime Minister, President and the Council of Ministers and the State Legislature.
CO4	To Know how the municipal office, panchayat office etc. work for development of the society.
CO5	To understand the significance and function of the Election Commission.

Course Outcomes: Students will be able to	
CO1	To know the importance and need of Constitution for a democratic government .
CO2	To follow the fundamental rights, duties and principles and become a good citizen.
CO3	To be aware and respect the seminal positions like Prime Minister, President, Chief Minister, Council of Ministers, Local Administration, etc.
CO4	To understand the function of Election Commission and importance of following it.
CO5	To understand the Importance of Secularism, Federalism, Democracy, Liberty, Freedom of Expression, Special Status of States, etc.

Course Contents

Module 1	Introduction	Hrs. 5
Constitution' meaning of the term,, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive, Principles of State Policy		
Module 2	**Union Government and its Administration**	**Hrs. 5**
Structure of the Indian Union: Federalism, Centre- State, relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.		
Module 3	**State Government and its Administration**	**Hrs. 4**
Governor: Role and Position, CM and Council of ministers, State Secretariat: Organisation, Structure and Functions		
Module 4	**Local Administration**	**Hrs. 5**
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati Raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.		
Module 5	**Election Commission**	**Hrs. 5**
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.		

Text Books:	
1	Sastry, T. S. N., (2005). India and Human rights: Reflections, Concept Publishing Company India (P Ltd.)
2	Nirmal, C.J., (1999). Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.

Dr. Babasaheb Ambedkar Technological University, Lonere

Teaching & Evaluation Scheme for Second Year B. Tech. Civil Engineering

Sr. No.	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
			L	T	P	ISE	MSE	ESE	Total	
Semester-IV										
1	BTCVPCT401	Structural Mechanics-I	3	0	0	20	20	60	100	3
2	BTCVPCT402	Concrete Technology	3	0	0	20	20	60	100	3
3	BTCVPCT403	Hydraulics Engineering	3	0	0	20	20	60	100	3
4	BTCVPCT404	Building Planning & Drawing	3	0	0	20	20	60	100	3
5	BTCVHMT405	Universal Human Values	3	0	0	20	20	60	100	3
6	BTCVOET406	OPEN ELECTIVE-2 (from bucket)	3	0	0	20	20	60	100	3
7	BTCVPCL407	Concrete Technology Lab	0	0	2	50	-	50	100	1
8	BTCVPCL408	Hydraulics Lab	0	0	2	25	-	25	50	1
9	BTCVPCL409	Building Planning & Drawing Lab	0	0	2	50	-	50	100	1
10	BTCVOEL410	OPEN ELECTIVE-2 –LAB	0	0	2	25	-	25	50	1
11	BTCVHMP411	Life of Chhatrapati Shivaji Maharaj	1	0	0	50	-	-	50	1
		TOTAL	**19**	**2**	**6**	**320**	**120**	**510**	**950**	**23**

Sr.No.	Multidisciplinary Minor Courses	Open Elective (OE)
A	Engineering Geology	Building Materials
B	MOOC-/SWAYAM/ NPTEL	Advanced Surveying
C		Advanced Geographical Information Systems
		Applications of Drone Technology

SUBJECT CODE	Structural Mechanics– I	CREDITS
BTCVPCT401		3

Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	3	20	20	60	100

Course Objectives	
CO1	To learn various methods to estimate deflection of beams
CO2	To learn Energy methods to solve structural system.
CO3	To learn Compatibility methods to solve indeterminate structures
CO4	To learn Determination of Continuous and end support moments of indeterminate beams and frames
CO5	To learn slope deflection method for analysis of structures

Course Outcomes: Students will be able to	
CO1	Describe the concept of structural analysis, degree of indeterminacy.
CO2	Calculate slopes and deflection at various locations for different types of beams.
CO3	Identify determinate and indeterminate trusses and calculate forces in the members of trusses.
CO4	Perform the distribution of the moments the in continuous beam and frame.
CO5	Calculate the deformations in frames.

Course Contents

Module 1	**Beam Deflections**	**Hrs. 6**
Calculations of deflection for determinate beams by double integration, Macaulay's method, moment area method, conjugate beam method, deflection by method of superposition.		
Module 2	**Energy Principles**	**Hrs. 6**
Strain energy and strain energy density, strain energy in traction, shear, flexure and torsion - Castiglano's and Engessor's energy theorems, principle of virtual work, application of energy theorems for computing deflections in beams, Maxwell's reciprocal theorem, Williot Mohr diagrams.		
Module 3	**Method of Consistent Deformation**	**Hrs. 8**
Different structural systems, concept of analysis, basic assumptions, indeterminacy, choice of unknowns, Castiglano's theorem Indeterminate Beams: Analysis of indeterminate beams: Propped cantilever and fixed beams - fixed end moments and reactions for standard cases of loading – slopes and deflections in fixed beams.		
Module 4	**Moment Distribution Method**	**Hrs. 8**
Analysis of continuous beams propped cantilevers, continuous beams - theorem of three moments - analysis of continuous beams settlement effects, thermal effect, Shear Force and Bending Moment diagrams for continuous beams, portal frames with and without sway.		
Module 5	**Slope Deflection Method**	**Hrs. 8**
Analysis of continuous beams, analysis of rigid frames, frames without sway and with sway, settlement effects,		

introduction to difficulties in frames with sloping legs and gabled frames

Text Books:	
1	Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill,3rd edition 2010
2	Wang C.K., "Statically Indeterminate Structures", McGraw Hill
3	Vazirani V.N., Ratwani M.M and Duggal S.K., "Analysis of Structures - Vol. I", ISBN NO: 978-81-7409-140-8
4	Khurmi R.S., "Theory of Structures", S Chand, Delhi
5	Punmia B.C., "Structural Analysis", Laxmi Publications

Reference Books:	
1	Timoshenko and Young, "Theory of structures", McGraw Hill
2	Norris C. H. and Wilbur J. B., "Elementary Structural Analysis", McGraw Hill
3	Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH
4	Hibbler R. C., "Structural Analysis", Pearson Publications, 9th Edition
5	Schodek, "Structures", Pearson Education, 7th edition
6	Ramamrutham S. and Narayanan R., "Theory of Structures" Dhanpat Rai Publishers, Delhi

SUBJECT CODE	Concrete Technology			CREDITS			
BTCVPCT402				3			
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	03	20	20	60	100

Course Objectives	
CO1	To Learn about different ingredients of concrete.
CO2	Understand the manufacturing of concrete
CO3	To Learn about use of concrete as per type of construction.
CO4	Understand behavior of concrete after casting.
CO5	To learn about increasing strength of concrete.

Course Outcomes: Students will be able to	
CO1	Understand the various types and properties of ingredients of concrete
CO2	Understand the fresh properties of fresh concrete.
CO3	Understand effect of admixtures on the behavior of the fresh and hardened concrete.
CO4	Understand the fresh properties of harden concrete.
CO5	Formulate concrete design mix for various grades of concrete.

Course Contents

Module 1	Ingredients of Concrete	Hrs. 6
Cement, Manufacturing Process, Physical Properties, Hydration of Cement, hydration products, Chemical Compounds in Cement, Types of Cement, Aggregates: Classification of aggregates, Physical Properties, Bulking of Sand, Mechanical Properties, Water: Specifications of Water to be used for Concert.		
Module 2	**Properties of Fresh Concrete**	**Hrs. 6**
Types of Batching, Mixing, Transportation, Placing Including Pumping and Compaction Techniques for Good Quality Concrete, Workability, Factors affecting workability, Methods of Measuring Workability, Segregation and Bleeding, setting time, Curing of Concrete, Types of curing, Temperature Effects on Fresh Concrete.		
Module 3	**Admixtures In Concrete**	**Hrs. 6**
Types, Plasticizers and Super-plasticizers and their Effects On Workability, Air Entraining Agents, Accelerators, Retarders, Pozzolanic Admixtures, Green concrete, Bonding Admixtures, Damp-Proofing Admixtures, Construction Chemicals.		
Module 4	**Properties of Harden Concrete**	**Hrs. 6**
Desired Properties of Concrete, Strength, Durability &Im-permeability, Characteristic Strength, Compressive, Tensile and Flexure of Concrete, Bond Strength, Tests on Concrete, Modulus of Elasticity, Effect of W/C Ratio and admixtures on Strength, Types of concrete, High Strength and High Performance Concrete Creep and Shrinkage of Concrete, Significance, Types of Shrinkage and Their Control,Factors Affecting Creep. Durability of Concrete: Minimum & Maximum Cement Content, Strength & Durability Relationship, Exposure to Different Conditions, Factors Contributing to Cracks in Concrete, Sulphate Attack, Alkali Aggregate Reaction (AAR), factors affecting on AAR, Deteriorating effects of AAR, Chloride Attack, Corrosion of Steel (Chloride Induced)		
Module 5	**Concrete Mix Design**	**Hrs. 6**
Nominal Mix Concrete, Factors Governing Mix Design, Methods of Expressing Proportions, Trial Mixes, Acceptance Criteria, Factors Causing Variations, Field Control, Statistical Quality Control, Quality Measurement in Concrete Construction, Non-destructive Testing of Concrete.		

Text Books:	
1	Gambhir M. L. “Concrete Technology”, Tata Mc-Graw Hill 2015 15th edition
2	Shetty M. S. “Concrete Technology”, S. Chand 2005
3	Krishnaswamy, “Concrete Technology”, DhanapatRai and Sons

Reference Books:	
1	Orchard, “Concrete Technology”, Applied Science Publishers
2	Neville A. M., “Concrete Technology”, Pearson Education

3	Neville A. M., "Properties of Concrete", Pearson Education
4	Relevant Publications by Bureau of Indian Standards, New Delhi
5	IS:10262(2009), IS:456 (2009), IS 4926 (2003)

SUBJECT CODE	Hydraulics Engineering	CREDITS
BTCVPCT 403		3

Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	03	20	20	60	100

Course Objectives	
CO1	To introduce and give explanation of fundamentals of Fluid Mechanics and give fundamental knowledge of fluid with its properties, behaviour, forces on various surfaces and stability of submerged and floating body.
CO2	To develop understanding about Kinematics of fluid flow and equation used for analysis of dynamic fluids.
CO3	To provide students with a comprehensive understanding of fluid dynamics
CO4	To introduce the importance of Compressibility effect in pipe flow.
CO5	To introduce the importance of fluid Flow in Pipes and determine the losses in a flow system.

Course Outcomes: Students will be able to	
CO1	Explain fundamental properties of fluids and calculate pressure.
CO2	Deeply understanding of fluid kinematics and dynamics.
CO3	Analyze laminar and turbulent flow characteristics, apply boundary layer theory, and understand the
CO4	Understand the concepts of dimensional analysis use the dimensionless number suitably.
CO5	Analyze head loss and energy loss in pipes, solve pipe network.

Course Contents

Module 1	**Fluid Statics**	**Hrs. 6**

Fluid properties and their role in fluid motion, concept of continuum, Types of fluids and their characteristics, Fluid Pressure – Pascal's Law and its measurement, Hydrostatic pressure on plane and curved surfaces, Buoyancy- Centre of buoyancy, stability of submerged and floating bodies, metacentre, metacentric height and its determination.

Module 2	**Kinematics & Dynamics of Fluid Flow**	**Hrs. 8**

Fluid Kinematics – Types of fluid flows, Continuity equation for one, two and three dimensional flows, Velocity and Acceleration, Velocity potential and Stream function, Vortex flow, Concept of flow net.

Fluid Dynamics – Equation of motion, Euler's equation, Bernoulli's equation and practical applications of Bernoulli's equation: Venturi meter, Orifice meter and Pitot tube, Momentum Equation, Free and forced vortex flow, Radial flow, Concept of Navier-Stokes equation.

Module 3	**Laminar & Turbulent Flow**	**Hrs. 8**

Laminar Flow – Laminar flow between parallel, stationary and moving plates, Flow through tube. Turbulent Flow – Shear stress in turbulent flow and Turbulent velocity profiles in fully developed pipe flow, Velocity distribution and shear stress in turbulent flow, Prandtl mixing length theory, Nikuradse's experiment.

Boundary Layer Theory – Concept of boundary layer theory, Thickness of boundary layer, Separation of boundary layer. Concept of Lift and Drag.

Module 4	**Dimensional Analysis**	**Hrs. 5**

Dimensions of various physical quantities, Rayleigh's method, Buckingham π method, Model Similitude, Model scales, Non-dimensional numbers and their significance, Distorted and undistorted models.

Module 5	**Flow through Pipes**	**Hrs. 9**

Minor losses, Head loss due to friction – Darcy-Weisbatch equation, H.G.L. and T.E.L., Loss of energy in pipes, Pipe discharging for a reservoir, Pipe connecting two reservoir in series and parallel, Pipe network analysis by Hardy Cross method, Siphon, Power transmission, Water Hammer in pipes-rigid and elastic water column theory, Surge tanks-function and types, Introduction to Moody's chart, Nomograms and other pipe diagrams.

Text Books:

1	Hydraulics and Fluid Mechanics including Hydraulics Machines by Dr. P. N. Modi and Dr. S. M. Seth, Standard Book House. ISBN: 978-81-89401-26-9
2	A Textbook of Fluid Mechanics and Hydraulic Machines by Dr. R. K. Bansal, Laxmi Publications. ISBN: 978-81-31808-15-3
3	Fluid Mechanics including Hydraulic Machines by A. K. Jain, Khanna Publishers. ISBN: 978-81-74091-94-9
4	Introduction To Fluid Mechanics by Philip J. Pritchard, John Wiley & Sons, INC. ISBN: 978-04-70547-55-7
5	Theory and Applications of Fluid Mechanics by K. Subramanya, McGraw-Hill Higher Education. ISBN: 978-00-74603-69-7

Reference Books:

1	Introduction to Fluid Mechanics & Fluid Machines by S. K. Som & G. Biswas, Tata McGraw-Hill. ISBN: 978-00-71329-19-4
2	Fluid Dynamics by V. L. Streeter, K. W. Bedford and E. B. Wylie, New York, McGraw-Hill.
3	Fluid Mechanics by K. L. Kumar, S. Chand publication.

SUBJECT CODE	Building Planning & Drawing	CREDITS
BTCVPCT404		3

Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	3	20	20	60	100

Course Objectives

CO1	Understanding principles of planning & bye laws
CO2	Understanding green building concept
CO3	Understanding services like plumbing, drainage, electrification, air conditioning
CO4	Understanding Fire resistance & Acoustics in building

Course Outcomes: Students will be able to	
CO1	To plan buildings considering various principles of planning
CO2	To plan buildings considering various Bye laws of governing body.
CO3	Understanding green building principles & anthropometry
CO4	Understanding various services like plumbing, electrification, ventilation
CO5	Understanding fire resistance & Acoustics in building

Course Contents

Module 1	**Planning & Design**	**Hrs. 8**
Principles of building planning, significance sun diagram, wind diagram, orientation, Design considerations for apartment, bungalow, row house & twin bungalow. Building Bye laws – open space, height & size of rooms & building, parking, garden, toilet etc. Anthropometry: Study of Human dimensions, space required for various simple activities, Circulation spaces.		
Module 2	**Plumbing & electrification**	**Hrs. 8**
Concept of plumbing & drainage plan, understanding details of drainage layout various types of traps, fittings, pipes, chambers, design of septic tank, Electrification - Lighting design with Lumen method, Lighting layout with furniture arrangement, wiring methods.		
Module 3	**Ventilation & Thermal insulation**	**Hrs. 8**
Definition, necessity of ventilation, functional requirements, various system & selection criteria Artificial ventilation - Air conditioning: Purpose, classification, principles, working. Thermal Insulation: General concept, Principles, Materials, Methods Computation of Heat loss & heat gain in Buildings		
Module 4	**Fire resistant in Building**	**Hrs. 6**
Causes of fire, Rules & regulations for means of access, height, open space etc Fire zones, Fire loads, Fire resistance of various building materials. Firefighting equipment's – extinguishers, hydrants, sprinklers, wet riser, down comer etc Fire detection system, fire alarm system, Fire staircase, fire lift, fire door		
Module 5	**Acoustics, Green Building**	**Hrs. 6**
Causes of fire, Rules & regulations for means of access, height, open space etc Fire zones, Fire loads, Fire resistance of various building materials. Firefighting equipment's – extinguishers, hydrants, sprinklers, wet riser, down comer etc Fire detection system, fire alarm system, Fire staircase, fire lift, fire door		

Text Books:	
1	Shah, Kale, Pataki, "Building Drawing", Tata McGraw- Hill
2	Sane Y. S.,"Building Design and Drawing", Allied Book Stall, Pune

3	Jain V.K., "Handbook of Designing and Installation of Services in High Rise Building Complexes", Khanna Publishers, N. Dehli,

Reference Books:	
1	Deodhar S.V., "Building Science and Planning", Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-199-8
2	SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi
3	I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings
4	Jain A.K., "The Idea of Green Building"Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-256-4

SUBJECT CODE	Universal Human Values - II			CREDITS			
BTCVHMT405				3			
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	3	20	20	60	100

Course Outcomes: Students will be able to	
CO1	Understand about necessity of Value Education.
CO2	Learn about harmony among humans.
CO3	Learn about harmony in the society.
CO4	Learn about harmony in the nature.
CO5	Learn about holistic approach in profession.

Course Contents

Module 1	**Introduction to Value Education**	**Hrs. 6**
Understanding Value Education - Self-exploration as the Process for Value Education. Continuous Happiness and Prosperity – the Basic Human Aspirations. Right Understanding, Relationship and Physical Facility. Happiness and Prosperity – Current Scenario. Method to Fulfill the Basic Human Aspirations		
Module 2	**Harmony in the Human Being**	**Hrs. 6**
Understanding Human being as the Co-existence of the Self and the Body. Distinguishing between the Needs of the Self and the Body. The Body as an Instrument of the Self. Understanding Harmony in the Self Harmony of the Self with the Body. Programme to Ensure self-regulation and Health.		
Module 3	**Harmony in the Family and Society**	**Hrs. 6**
Harmony in the Family – the Basic Unit of Human Interaction. Values in Human-to-Human Relationship.'Trust' – the Foundational Value in Relationship. 'Respect' – as the Right Evaluation.Understanding Harmony in the Society. Vision for the Universal Human Order.		
Module 4	**Harmony in the Nature (Existence)**	**Hrs. 10**

Understanding Harmony in the Nature. Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature. Realizing Existence as Co-existence at All Levels. The Holistic Perception of Harmony in Existence		
Module 5	**Implications of the Holistic Understanding – a Look at Professional Ethics**	**Hrs. 10**
Natural Acceptance of Human Values. Definitiveness of (Ethical) Human Conduct. A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order. Competence in Professional Ethics. Holistic Technologies, Production Systems and Management Models-Typical Case Studies.Strategies for Transition towards Value-based Life and Profession		

Text Books:	
1	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
3	Arora K. R., "Soil Mechanics and Foundation Engineering", Standard publishers
4	Punima B. C., "Soil Mechanics and Foundation Engineering", Laxmi publication
5	Nayak N. V., "Foundation Design Manual", Dhanpat Rai and Sons
6	NPTEL Video Lectures of Geotechnical Engg of Prof Dr. D. N. Singh IIT Bombay https://www.youtube.com/playlist?list=PLOzRYVm0a65dtbpo_DP7acjsLYdmWT99r

Reference Books:	
1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3	The Story of Stuff (Book).
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher.
6	Slow is Beautiful - Cecile Andrews
7	Economy of Permanence - J C Kumarappa
8	Bharat Mein Angreji Raj - PanditSunderlal
9	Rediscovering India - by Dharampal
10	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11	India Wins Freedom - Maulana Abdul Kalam Azad
12	Vivekananda - Romain Rolland (English)
13	Gandhi - Romain Rolland (English)

SUBJECT CODE	Advanced Surveying						CREDITS
BTCVOET406							3
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
3	0	0	3	20	20	60	100

Course Objectives:	
CO1	To get introduced to modern advanced surveying techniques involved such as remote sensing, Total station, GPS, Photogrammetry etc.
CO2	To learn about errors in measurements and their adjustments in a traverse.
CO3	To understand the principles and workings of Electronic Distance Measurement.
CO4	To get an understanding preparation of the contour map and compute area.
CO5	Recognize modern developments in surveying and develop introductory Geographic Information System (GIS) skills.

Course Outcomes: Students will be able to	
CO1	Learn about the basic principles and area calculation methods by Tacheometric surveying methods.
CO2	Understand the basic principles and workings of Total Station.
CO3	Learn about the basic principles and workings of Electronic Distance Measuring (EDM).
CO4	Understand the basic principles of GPS, GIS, and Remote Sensing.
CO5	Learn about advanced surveying technologies.

Course Contents

Module 1	**Geodetic Surveying & SBPS**	**Hrs. 6**
Introduction, purpose, and principles of tacheometric surveying. Instruments used in Tacheometry, Methods of Tacheometry (Stadia & Tangential) Methods of determining constants of Tacheometer and related examples using all methods. Anallactic Lens, advantages & disadvantages.		
Module 2	**Total Station**	**Hrs. 8**
Introduction and basics of Total Station like working principle, integral parts. Types of Total Station and entire setup. Total Statin survey system errors and avoiding techniques. Overview of the computerized survey data system.		
Module 3	**Digital Theodolite and Electronic Distance Measuring (EDM)**	**Hrs. 6**
Introduction, purpose, features, and principles of Digital Theodolite. Parts and use of one-second Micro Optic Theodolite. Electronic Distance Measuring (EDM) instrument, basic principles and applications of E.D.M. Components of E.D.M and their functions.		
Module 4	**Remote Sensing & GIS for Surveying**	**Hrs. 8**
Basic principles of Remote Sensing & Geographic Information Systems, applications, and limitations. Platforms of GIS work. concept and types of thematic layers in GIS. Concept and applications of geospatial data, types of spatial data, and available sources. Photogrammetric Surveying – Principle, Scale, Number of Photographs,		

Deduction of distance& height		
Module 5	**Advanced Surveying Equipment**	**Hrs. 8**
Introduction, advancements in surveying equipment. Ground-based Lidar technology for surveying, working, advantages and limitations. Global Positioning System: - Types i.e., Handheld and Differential Global Positioning System, advantages and disadvantages. Drone Surveying: Overview, applications, and limitations.		

Text Books:	
1	Surveying & Levelling, 2/E—Subramanian—Oxford University Press
2	Surveying: Vol. II. and III by Dr. B. C. Punmia : Laxmi Publication - New Delhi.
3	Surveying and Levelling Vol. II by T. P. Kanetkar and S. V. Kulkarni Pune Vidyarthi Publication.
4	Satheesh Gopi, N. Madhu, R. Sathikumar "Advanced Surveying" Pearson Publications.
5	A. M. Chandra and S. K. Ghosh, "Remote sensing and Geographical Information System", Narosa Publishing House.
6	Remote Sensing & GIS,2/E—Bhatta-- Oxford University Press

Reference Books:	
1	Principles of Geographical Information System—Burrough-- Oxford University Press
2	Surveying—M.D.Saikia—PHI Learning Pvt .Ltd.Delhi
3	Basak, N. N., " Surveying and Levelling" McGraw Hill Education (India) Pvt. Ltd., Noida.
4	Duggal, S. K., "Survey I and Survey II", Tata McGraw Hill Education Pvt. Ltd., Noida.
5	Anderson, James M and Mikhail, Edward M, "Surveying theory and practice", Mc Graw Hill Education, Noida.

SUBJECT CODE	Concrete Technology Lab			CREDITS			
BTCVPCL407				1			
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
0	0	2	2	50	-	50	100

Course Outcomes:	Students will be able to
CO1	Analyze the properties of concrete and their verification.
CO2	Calculate different parameters for fresh concrete.
CO3	Understand properties of aggregates.
CO4	Design concrete mix.
CO5	Learn testing of concrete.

Course Contents

Practical Work consists of at least three performances from groups listed below and detailed reporting in form of journal.

Practical examination shall be based on above. Preform at least 10 to 12 experiments as per requirements

Experiment No.1	Testing of Cement: Consistency, Fineness, Setting Time, Specific Gravity
Experiment No.2	Soundness and Strength Test for Cement
Experiment No.3	Testing of Aggregates: Specific Gravity, Sieve Analysis, Bulking
Experiment No.4	Placement Tests on Concrete: Workability Tests: Slump, Compaction
Experiment No.5	Strength Tests on Concrete: Compression, Flexure, Split & Tensile Test
Experiment No.6	Effects of Admixture: Accelerator, Retarder, Super Plasticizer
Experiment No.7	Exercise and verification of Concrete Mix Design
Experiment No.8	Non-destructive Testing for Concrete

Use of computer programs such as MS Excel

is desirable for post-processing of results.

SUBJECT CODE	Hydraulics Lab						CREDITS
BTCVPCL408							1
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
0	0	2	2	25	-	25	50

Course Outcomes:	Students will be able to
CO1	Verify the basic energy principles (Bernoulli's equation).
CO2	Utilize the basic measurement techniques of fluid flow in orifice / mouthpiece / venturi meter / orifice meter.
CO3	Analyze the properties of fluids and their verification.
CO4	Calculate friction factor and major & minor losses in pipes.
CO5	Analyze the properties of different types of valves and pipe fittings.

Course Contents

Practical Work consists of at least eight performances from list below and detailed reporting in form of journal.

Experiment No 1	Measurement of Viscosity of various fluids
Experiment No 2	Determination of metacentric height
Experiment No 3	Measurement of pressure Piezometer, manometers, Pressure gauges
Experiment No 4	Measurement of discharge

Experiment No 5	Verification of Bernoulli's Theorem
Experiment No 6	Calibration of an orifice / mouthpiece / venturi meter / orifice meter
Experiment No 7	Demonstration of working of different types of valves and pipe fittings
Experiment No 8	Determination of loss of head due to Pipe Fittings
Experiment No 9	Study of factors affecting coefficient of friction for pipe flow (for two different materials and two different diameters)
Use of computer programs such as MS Excel is desirable for post-processing of results.	

SUBJECT CODE	Building Planning & Drawing Lab						CREDITS
BTCVPCL409							1
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
0	0	2	2	50	-	50	100

Course Outcomes:	Students will be able to
CO1	To Draw plan, elevation & section of structure
CO2	To draw municipal drawing
CO3	To draw electrical layout
CO4	To draw drainage layout
CO5	To draw furniture layout

Course Contents

Term work shall consist of detailed report of in form of set of drawings mentioned below. In practice sessions, free-hand sketching in drawing book is expected.

1	Architectural drawing (Plan, section & elevation of a building) apartment, row house etc
2	Municipal drawing
3	Center line plan
4	Foundation plan
5	Furniture layout
6	Electrical / lighting layout
7	Drainage layout
8	Rain water Harvesting Drawing

SUBJECT CODE	Advanced Surveying Lab						CREDITS
BTCVOEL410							1
Teaching Work Load/week(Hrs.)				Examination Scheme(Marks)			
Theory	Tutorial	Laboratory	Total	ISE	MSE	ESE	Total
0	0	2	2	25	-	25	50

Course Outcomes:	Students will be able to
CO1	Utilize total station for various ground surveys.
CO2	Know traversing with the help of Digital Theodolite.
CO3	Take geographical coordinates using GPS for area calculation.
CO4	Prepare digitized topographic maps for surveying large areas.
CO5	Prepare digital thematic maps like slope maps, aspect maps etc.

Course Contents

Experiment No.1	Tacheometry Survey: To Carry out the project for 3 to 4 stations for closed traverse on undulating/hills regions and prepare the drawing sheet.
Experiment No.2	Total Station Survey: - To carry out the project for a small traverse on the ground and drawing contour map.
Experiment No.3	Determination of height, remote elevation, and distance between inaccessible points using Total Station.
Experiment No.4	Digital Theodolite: - Use of Theodolite as a Tacheometer with staff held in vertical and fixed hair method (No derivation).
Experiment No.5	Electronic Distance Measurement Meter: - Working and measurement techniques.
Experiment No.6	Digitization of map/ toposheet using software like GIS software.
Experiment No.7	Creation of thematic maps of toposheet using GIS software.
Experiment No.8	Handheld GPS Survey: - Area mapping, calculation, and preparation of report (excel or doc or pdf format).